

CLAIMS

1. A fluid dispenser (1) for dispensing a metered volume of a fluid product (2) having:-

- (a) a storage chamber (57) for storing the fluid product in;
- (b) a dispensing outlet (27) through which the fluid product is dispensable from the dispenser;
- (c) a metering chamber (73) which is adapted to provide the metered volume of the fluid product for dispensing through the dispensing outlet by movement of the metering chamber between contracted (Fig. 2A) and expanded states (Fig. 2D) thereof, movement of the metering chamber from its contracted state to its expanded state placing the metering and storage chambers in fluid communication to enable the metering chamber to receive from the storage chamber an excess volume of the fluid product comprising the metered volume and a surplus volume; and
- (d) a bleed arrangement (55a, 55b) adapted to bleed the surplus volume of the fluid product from the metering chamber;

wherein:-

- (e) the metering chamber is defined by a boundary wall (28, 43);
- (f) an outlet (33) is provided in the boundary wall through which the metered volume of the fluid product is transferable from the metering chamber to the dispensing outlet; and
- (g) the storage chamber, the metering chamber and the outlet are disposed in the dispenser in an in-line arrangement.

2. The dispenser of claim 1, wherein the metering chamber boundary wall has a first section movably mounted in the dispenser to move the metering chamber between the expanded and contracted states.

3. The dispenser of claim 1 or 2, wherein at least one transfer port is provided in the boundary wall through which the metering and storage chambers are placed in fluid communication and the at least one transfer port is selectively opened and

closed when the metering chamber moves between its expanded and contracted states.

4. The dispenser of claims 2 and 3, wherein the transfer port is in the first section.

5. The dispenser of claim 3 or 4, wherein the transfer port is closed when the metering chamber is at an intermediate state between its expanded and contracted states.

6. The dispenser of claim 5, wherein the metering chamber has a volume corresponding to, or substantially corresponding to, the metered volume when at the intermediate state.

7. The dispenser of claim 5 or 6, wherein the transfer port is closed when the metering chamber moves between the intermediate and contracted states and open when the metering chamber moves between the intermediate and expanded states.

8. The dispenser of any one of the preceding claims, wherein the boundary wall has a second section and the metering chamber is movable between its expanded and contracted states by movement of the first section in the dispenser relative to the second section.

9. The dispenser of claim 8, wherein the second section is stationary in the dispenser.

10. The dispenser of any one of claims 3 to 7 and claim 8 or 9, wherein the second section is adapted in use to selectively open and close the transfer port.

11. The dispenser of any one of claims 8 to 10, wherein the outlet is provided in the second section of the metering chamber boundary wall.

12. The dispenser of claim 2 or any claim appended thereto, wherein the first section of the metering chamber boundary wall and the storage chamber are provided by a container unit which is movably mounted in the dispenser
13. The dispenser of claim 12, wherein the container unit is adapted in use to operate as a pump mechanism for filling and emptying of the metering chamber.
14. The dispenser of any one of the preceding claims, wherein movement of the metering chamber from its contracted state to its expanded state causes a pressure difference between the metering and storage chambers which results in the excess volume of the fluid product being drawn into the metering chamber.
15. The dispenser of any one of the preceding claims, wherein movement of the metering chamber from its expanded state to its contracted state pumps the metered volume of the fluid product out of the metering chamber.
16. The dispenser of any one of the preceding claims in which the metering chamber is repeatedly movable between its different states thereby enabling the dispenser to repeatedly dispense a metered volume of the fluid product.
17. The dispenser of any one of the preceding claims further having a valve mechanism which is adapted in use to keep the dispensing outlet closed until the bleed arrangement bleeds the surplus volume of the fluid product from the metering chamber.
18. The dispenser of claim 17 in which the valve mechanism is adapted to open the dispensing outlet as the metering chamber moves to its contracted state and to re-close the dispensing outlet when the contracted state is reached.
19. The dispenser of any one of claims 1 to 16 further having a valve mechanism at the outlet which is adapted to only allow the metered volume of the fluid product to be transferred to the dispensing outlet.

20. The dispenser of claim 19, wherein the valve mechanism is configured to close the outlet except when the metering chamber moves to its contracted state after the bleed arrangement bleeds the surplus volume of the fluid product therefrom.
21. The dispenser of any one of claims 17 to 20 in which the valve mechanism is a non-return valve mechanism.
22. The dispenser of any one of the preceding claims in which the dispensing outlet is in a nozzle of the dispenser.
23. The dispenser of claim 22, wherein the nozzle is configured as a mouthpiece or a nasal nozzle.
24. The dispenser of any one of the preceding claims in which the bleed arrangement is adapted in use to bleed the surplus volume of the fluid product in the metering chamber to the storage chamber.
25. The dispenser of claim 24 when appended to claim 3, wherein the bleed arrangement is adapted in use to bleed the surplus volume of the fluid product to the storage chamber through the transfer port.
26. The dispenser of any one of the preceding claims, wherein the storage chamber is adapted to move from an expanded state to a contracted state in response to the excess volume being transferred to the metering chamber.
27. The dispenser of claim 26 when appended to claim 24 or 25 in which the storage chamber is adapted to move back to an expanded state in response to the surplus volume being bled back thereinto.
28. The dispenser of claim 25 when appended to any one of claims 17 to 21, wherein:-  
the storage chamber is adapted to:-

(i) move from an expanded state to a contracted state in response to the excess volume being transferred to the metering chamber by movement of the metering chamber from its contracted state to its expanded state, and  
(ii) return to an expanded state in response to the surplus volume being bled back thereinto by movement of the metering chamber from its expanded state to its contracted state; and  
the valve mechanism has an opening pressure threshold which is greater than the pressure needed to return the storage chamber to its expanded state whereby the valve mechanism remains closed during bleeding of the surplus volume of the fluid product.

29. The dispenser of claim 27 or 28 adapted such that in use the volume of the expanded state of the storage chamber prior to transfer of the excess volume of the fluid product to the metering chamber is greater than the volume of its expanded state after recycling of the surplus volume thereinto.

30. The dispenser of any one of claims 26 to 29 in which the storage chamber is adapted to move between its expanded and contracted states by pressures created by movement of the metering chamber between its expanded and contracted states.

31. The dispenser of any one of claims 26 to 30 in which the storage chamber has a boundary wall having first and second sections which are movable relative to one another to bring the storage chamber to its expanded and contracted states.

32. The dispenser of claim 31 when appended to claim 3 in which the transfer port is located in the first section of the storage chamber boundary wall with the second section of the storage chamber boundary wall being spaced from the transfer port.

33. The dispenser of claim 32 adapted such that in use the spacing of the second section of the storage chamber boundary wall from the transfer port

decreases after each cycle of movement of the metering chamber between its expanded and contracted states.

34. The dispenser of any one of claims 31 to 33 in which the second section of the storage chamber boundary wall is slidably mounted on the first section of the storage chamber boundary wall.

35. The dispenser of claim 34 in which the second section of the storage chamber boundary wall presents an end wall of the storage chamber which is sealingly slidably mounted on the first section of the storage chamber boundary wall.

36. The dispenser of any one of claims 31 to 35 when appended to claim 2, wherein the first section of the storage chamber boundary wall comprises the first section of the metering chamber boundary wall.

37. The dispenser of claim 12 or any claim appended thereto in which the container unit is mounted for translational movement in the dispenser.

38. The dispenser of any one of the preceding claims having an axis on which the storage and metering chambers are disposed.

39. The dispenser of claims 37 and 38 in which the container unit is mounted for movement on the axis.

40. The dispenser of claim 38 or 39, wherein the outlet is located on the axis.

41. The dispenser of claim 38, 39 or 40 in which the dispensing outlet is located on the axis.

42. The dispenser of claim 41 in which the outlet and the dispensing outlet are at opposed ends of an axial channel of the dispenser.

43. The dispenser of claim 22 or any claim appended thereto in which the nozzle is arranged in-line with the storage chamber, the metering chamber and the outlet.
44. The dispenser of claim 2 or any claim appended thereto, wherein the first section of the metering chamber boundary wall is mounted for sliding movement on the second section of the metering chamber boundary wall.
45. The dispenser of claim 44 when appended to claim 8, wherein the first section of the metering chamber boundary wall is sealingly slidably mounted on the second section of the metering chamber boundary wall.
46. The dispenser of any one of claims 38 to 42 and claim 44 or claim 45, wherein the first section of the metering chamber boundary wall presents at least a portion of an axially-oriented side of the metering chamber.
47. The dispenser of claim 46 when appended to claim 3, wherein the transfer port is provided in the axially-oriented side of the metering chamber.
48. The dispenser of claim 2 or any claim appended thereto, wherein the first section of the metering chamber boundary wall presents a movable end wall of the metering chamber.
49. The dispenser of claim 2 or any claim appended thereto in which the first section of the metering chamber boundary wall has a generally U-shape.
50. The dispenser of claims 46, 48 and 49, wherein the end wall of the metering chamber is presented by the base of the U-shape and the side of the metering chamber is presented by the limbs of the U-shape.
51. The dispenser of claim 46, 47 or 50 when appended to claim 8, wherein the second section of the metering chamber boundary wall is presented by a structure

having an axially-oriented surface on which the side of the metering chamber is slidably mounted.

52. The dispenser of claim 51, wherein the axially-oriented surface of the structure is an outer surface.

53. The dispenser of claim 8 and any claim appended thereto, wherein the second section of the metering chamber boundary wall presents an end wall of the metering chamber.

54. The dispenser of claim 8 and any claim appended thereto, wherein the second section of the metering chamber boundary wall is presented by a generally U-shape structure.

55. The dispenser of claim 51 or 52 and claims 53 and 54 in which the base of the U-shape structure presents the end wall of the metering chamber and the limbs of the U-shape structure present the axially-oriented surface.

56. The dispenser of claim 12 or any claim appended thereto in which the first section of the metering chamber boundary wall is formed by a female depression in an outer surface of the container unit.

57. The dispenser of claim 56 when appended to claim 8 in which the second section of the metering chamber boundary wall is formed as a male projection which is inserted into the female depression.

58. The dispenser of claim 56 or 57 in which the depression extends into the storage chamber.

59. The dispenser of claim 58 in which the storage chamber surrounds the depression.

60. The dispenser of any one of the preceding claims in which at least a portion of the storage chamber surrounds the metering chamber.
61. The dispenser of claim 60 in which the at least a portion of the storage chamber is concentrically arranged with the metering chamber.
62. The dispenser of any one of the preceding claims in which the metering chamber has zero volume, or substantially zero volume, when in its contracted state.
63. The dispenser of claim 62 when appended to claim 8, wherein the first and second sections of the metering chamber boundary wall abut in the contracted state.
64. The dispenser of claim 63, wherein the first and second sections of the metering chamber boundary wall are of complementary shape.
65. The dispenser of claim 63 or 64 in which the first and second sections nest in the contracted state.
66. The dispenser of claim 2 or any claim appended thereto in which the first section of the metering chamber boundary wall closes off the outlet in the contracted state of the metering chamber.
67. The dispenser of any one of the preceding claims which is hand-held.
68. The dispenser of any one of the preceding claims having a manually-operable actuating mechanism for actuating movement of the metering chamber between its different states.
69. The dispenser of claim 68 when appended to claim 12 in which the actuating mechanism has a manually-engageable actuator member which is

operatively coupled to the container unit to move the container unit such that the metering chamber completes a cycle between its different states.

70. The dispenser of claim 68 in which the actuating mechanism has a manually-engageable actuator member movably mounted on the dispenser, movement of the actuator member causing a complete cycle of movement of the metering chamber between its different states.

71. The dispenser of claim 69 or 70 adapted such that movement of the actuator member in a single direction causes a complete cycle of the metering chamber between its different states.

72. The dispenser of claim 71 in which the direction is inward with respect to the dispenser.

73. The dispenser of claim 72 in which the actuator member is biased in an outward direction.

74. The dispenser of any one of claims 69 to 73 in which the actuator member is a trigger member.

75. The dispenser of any one of claims 69 to 74 in which the actuator member is pivotally mounted on the dispenser.

76. The dispenser of any one of claims 69 to 75 in which the dispensing outlet is located at an upper end of the dispenser and the actuator member is mounted on a side of the dispenser.

77. The dispenser of claims 75 and 76, wherein the actuator member has a pivot point at a lower end thereof.

78. The dispenser of any one of the preceding claims having a rest condition in which the metering chamber is in the contracted state.

79. The dispenser of claims 68 and 78 when appended to claim 12, wherein in the rest condition the container unit is disposed in a rest position in the dispenser and the actuating mechanism is adapted to move the container unit through a cycle which commences, and ends, at the rest position and passes through a priming position, in which the metering chamber is in its expanded state, upon actuation of the actuating mechanism.

80. The dispenser of claim 79 in which the actuating mechanism biases the container unit to the rest position.

81. The dispenser of any one of the preceding claims having a fluid product contained in the storage chamber.

82. The dispenser of claim 81 in which the fluid product is selected from the group consisting of a liquid, a viscous product, a powder and a gas.

83. The dispenser of claim 81 or 82 in which the fluid product is a medicament.

84. The dispenser of claim 81, 82 or 83 in which the fluid product is preservative-free.

85. The dispenser of any one of the preceding claims in which the bleed arrangement is adapted such that the surplus volume of the fluid product is caused to bleed from the metering chamber by movement of the metering chamber from the expanded state towards the contracted state

86. The dispenser of any one of the preceding claims in which the metering chamber has an inlet port through which the metering and storage chambers are able to be placed in fluid communication and further in which there is an inlet valve mechanism associated with the inlet port for selectively opening and closing the inlet port, wherein the inlet valve mechanism is adapted to open the inlet port when the metering chamber moves from its contracted state to its expanded state.

87. The dispenser of claim 86 in which the inlet valve mechanism is a non-return valve.
88. The dispenser of claim 86 or 87 when appended to claim 14 adapted such that the pressure difference causes the inlet valve mechanism to open the inlet port.
89. The dispenser of claim 86, 87 or 88 in which the inlet valve mechanism has a biasing mechanism for biasing the inlet valve mechanism to shut the inlet port.
90. The dispenser of any one of claims 86 to 89 adapted such that the inlet valve mechanism opens the inlet port in an initial phase of movement of the metering chamber from its contracted state to its expanded state.
91. The dispenser of any one of claims 86 to 90 adapted such that on opening of the inlet port on movement of the metering chamber from its contracted state to its expanded state the open inlet port is the sole flow path for the fluid product to enter the metering chamber from the storage chamber.
92. A dispenser unit having a dispenser according to any one of the preceding claims in which the dispensing outlet is a dispensing outlet of the unit through which the metered volume of the fluid product is, in use, dispensed to the external environment.
93. A device unit having a dispenser according to any one of claims 1 to 91 wherein the dispensing outlet is an internal outlet of the unit through which, in use, the metered volume of the fluid product is dispensed into the unit.
94. The device unit of claim 93 further having a dispensing outlet which opens to the external environment about the unit and means for conveying the fluid product dispensed through the internal outlet to the external environment through the dispensing outlet.

95. The device unit of claim 94 in which the conveying means is such as to change the state of the fluid product.
96. The device unit of claim 94 or 95 in which the conveying means has a vibrating element to aerosolise a liquid dispensed by the dispenser.
97. The device unit of claim 96 in which the vibrating element is a piezoelectric element.
98. A fluid dispenser substantially as hereinbefore described with reference to, and as illustrated by, Figures 1 to 3, Figures 1 to 4, Figures 1 to 3 and 5 or Figures 1 to 5 of the accompanying drawings.